

Solutions to random exercises from Chapter 1

1.1

11. a. The number of homes sold was increasing from the 4th quarter of 2003 until the 2nd quarter of 2004 and also from the 4th quarter of 2004 until the 3rd quarter of 2005. The number of homes sold was decreasing from the 2nd quarter of 2004 until the 4th quarter of 2004 and again from the 3rd quarter of 2005 until the 4th quarter of 2005.
b. There really is no distinguishable pattern. The change in the number of homes sold varies.
12. a. The total revenue (in millions) increases each year.
b. The total revenue (in millions) increases each year at a variable rate.
13. a. As the number of McDonald's locations increases the total revenue (in millions) increases.
b. A reasonable prediction would be to consider the data from 2004 to 2005. There was an increase of \$1395 million in total revenue and 325 more locations for an increase of \$4.29 million per location on average. With 114 more locations (32,000 – 31886) we could assume \$4.29 million per location or $\$20,460 + 4.29(114) = \$20,949.06$ million for 32,000 locations.
14. a. If we assume that the value of the vehicle continues to drop by 15% then we need to decrease the value in 2010 by 15%. $\$10,147 \times 0.15 = \1522.05 . $\$10,147 - \$1522.05 = \$8624.95$.
b. The dollar amount of depreciation decreases each year by a lesser amount.
c. No because the car will technically always have some value left.
15. a. As the years increase, the percentage of male non-teachers earning more than male teachers is increasing at a varying rate.
b. For some reason, males with non-teaching jobs must have gotten larger increases in their pay than male teachers from 1990 to 2000.
c. In 1940 male non-teachers were earning less than male teachers.
16. a. The percentage of non-teaching women earned less than teachers from 1940 to some time in the 1980's and then began to earn more. It also appears that the percentage of non-teaching women who earn a higher salary is increasing.
b. Question 1: What factors may have caused non-teaching women to begin earning more? Answer: Other higher paying jobs became open to women instead of low paying, low skill labor.
Question 2: Why did the percentage of non-teaching women who earn less than teachers change so dramatically in the 1960s? Answer: In American history the 60s was a time for minority and women's rights that may have begun to have an effect on women's salaries.

17. a. As the number of years of service increases so do the minimum salaries.
b. Question 1: Why do the minimum salaries increase as the number of years of service increase? Answer: The expectation is that the players become better with more experience so should make more money.
Question 2: Between what two years of service does the minimum salary increase the most? Answer: From 0 to 1 years of service the increase is \$242,986.

18. a. The ticket face value for the Super Bowl is increasing at an increasing rate.

Answers may vary.

- b. 1) How much longer can the ticket face value for the Super Bowl increase at such a large rate?

2) Why has the ticket face value increased so much over the years?

19. a. The average price for unleaded, regular gasoline has both increased and decreased over the years from 1990-2004.

Answers may vary.

- b. 1) What factors have contributed to the increase and decrease of the average price per gallon for unleaded, regular gasoline?

2) Explain whether these data can be used to predict future years' average price per gallon.

20. OMIT Please. This problem needs to be rewritten.

21. a. From the 4th quarter of 2002 until the 3rd quarter of 2004 the iPod sales increased slowly. From the 3rd quarter of 2004 until the 4th quarter of 2005 sales increased quickly. From the 4th quarter of 2005 until the 1st quarter of 2006 sales increased very quickly. From the 1st quarter of 2006 until the 2nd quarter of 2006 sales decreased a lot.
b. A possible explanation would be that it took some time for marketing and word-of-mouth promotion to be successful.
c. A possible explanation would be that so many iPods had been sold that the market was becoming saturated or perhaps competitors efforts to offer other options had slowed sales of the iPod.

22. a. 1940 to 1979

b. 1940-1949

c. 1970-1979

23. a. As the years increase, the number of alternative-fueled vehicles in use has

increased.

b. $\approx 400,000 - 250,000$
 $\approx 150,000$

c. $\approx 440,000$

24. a. As the years increase, the number of doctorates awarded in mathematics has decreased.

b. $\approx 1000 - 900$
 ≈ 100

c. $\approx 1000 + 100$ (3)
 ≈ 1300

25. a. Possible factors could be Vietnam war costs, space program accidents, or funding cuts.

b. Possible factors could be an added emphasis on the space program from Reagan's "star wars" program, increased funding, and new important goals for space exploration.

c. Just under 30 launches per year. ($207/7 = 29.6$)

d. A little over 15. ($61/4 = 15.3$)

26. a. As the number of women in the workforce (in 1000s) increases, the number of children enrolled in the Head Start program increases.

b. Answers may vary.

1) Why would the number of children enrolled in the Head Start program increase when the number of women in the workforce (in 1000s) increase?

2) Will the trend displayed in the graph continue in the future?

27. a. The average Arizona Diamondback's salary increased from 1998 to 2002 then decreased from 2002 to 2004 but then began to increase again from 2004 to 2005.

b. Question 1: Approximately how much more was the average player's salary in 2005 than in 1998? Answer: $\$2,250,000 - \$1,100,000 = \$1,150,000$.

Question 2: Approximately how much did the average player's salary drop from 2002 to 2004? Answer: $\$3,200,000 - \$1,600,000 = \$1,600,000$.

28. a. As the average salary (in millions of dollars) for New York Yankee players increases, the average salary (in millions of dollars) for Boston Red Sox players increases.

b. Answers may vary.

1) Will the average amount spent on New York Yankee players ever decrease

when the average amount spent on Boston Red Sox players increases?

- 2) How would the scenario described in question 1) above be represented graphically?
29. a. As the years increase, the number of students per teacher in Texas public schools decreases.
- b. Answers may vary.
- 1) What factors are effecting the number of students per teacher in Texas public schools?
- 2) What would it mean in terms of the number of students per teacher if for the years 2003 and 2004, the graph increased? Explain.
30. a. As the years increase, the average SAT math scores increased and the average SAT verbal scores both increased and decreased.
- b. Answers may vary.
- 1) What possible factors may explain why the graphs are changing as they do?
- 2) What would be the challenges in predicting the average SAT math score in 2010 from the graph provided?

1.2

1. $T(d)$ where d = number of dollars your home is assessed for, T = amount of property tax. T is the dependent variable and d is the independent variable.
2. $f(m)$. independent variable = time since your last manicure. Dependent variable = length of your fingernails.
3. $f(m)$. independent variable = time since your last manicure. Dependent variable = length of your fingernails.
4. $W(t)$ where W = number of gallons of water, t = temperature in degrees. W is the dependent variable and t is the independent variable.
5. $B(a)$ where B = a person's blood alcohol level, a = number of alcoholic drinks consumed in a two-hour period. B is the dependent variable and a is the independent variable.

26. $f(x) = 2x^2 - 3x$; $f(4) = 2(4)^2 - 3(4) = 32 - 12 = 20$

27. $v(t) = \frac{\sqrt{0.3t}}{10}$; $v(:)) = \frac{\sqrt{0.3(:)}}{10}$ $v(\odot) = (\sqrt{0.3\odot})10$

$$28. r(s) = |9s^2 - 2s + 18|; r(-2) = |9(-2)^2 - 2(-2) + 18| = |36 + 4 + 18| = 58$$

$$29. t(\Psi) = -(\Psi)^2 + 3\Psi - \frac{4}{\Psi}$$

$$30. h(b) = 3^b - 17b + b^2$$

$$31. m(x) = \sqrt{x^2 - 4x}; m(\odot + 3) = \sqrt{(\odot + 3)^2 - 4(\odot + 3)} = \sqrt{(\odot^2 + 6\odot + 9 - 4\odot - 12)} = \sqrt{(\odot^2 + 2\odot - 3)}$$

$$32. n(\square) = (-2\square + \square^3)^2$$

$$33. r(s) = r(\Theta + \Delta) = |9(\Theta + \Delta)^3 - 2(\Theta + \Delta) + 18|$$

$$34. t(v) = -v^2 + 3v - \frac{4}{v};$$

$$t(\Delta - \nabla) = -(\Delta - \nabla)^2 + 3(\Delta - \nabla) - \frac{4}{\Delta - \nabla} = -(\Delta^2 - 2\Delta\nabla + \nabla^2) + 3\Delta - 3\nabla - \frac{4}{\Delta - \nabla}$$

$$= -\Delta^2 + 2\Delta\nabla - \nabla^2 + 3\Delta - 3\nabla - \frac{4}{\Delta - \nabla}$$

$$35. h(b^2 + 7) = 3^{b^2 + 7} - 17(b^2 + 7) + (b^2 + 7)^2$$

$$36. p(27) = 121.46(27) + 5231.31 = 8510.73. \text{ In 2007 the number of children enrolled in preprimary school was 8,510,730. } p(27) = 8,510,730$$

$$37. E(t) = 1019.65t + 27861.97; E(20) = 1019.65(20) + 27861.97 = 48254.97. \text{ In 2010 the average annual expenditures of all U.S. consumers is \$48,254.97. } E(20) = 48254.97$$

$$38. c(y) = 168.9y + 6741; 9000 = 168.9y + 6741; 2259 = 168.9y; 13.37 = y; y \approx 13. \text{ In 2016 the number of students enrolled for Spring semester at Chandler-Gilbert Community College is 9000. } c(13) \approx 9000$$

$$39. 300,000 = 5844.95t + 56589.91; 243,410 = 5844.95t; 41.64 = t. \text{ The median sales price of new homes will be \$300,000 in 2021.}$$

$$40 \text{ a. } t = 2002 \text{ The number of recreational visits to U.S. National Parks was 277.3 million in 2002.}$$

$$\text{b. } P(2000) = 285.9. \text{ In 2000 the number of recreational visits to U.S. National Parks was 285.9 million.}$$

c. Many possible answers. The predictions will not be accurate because the data varies.

41 a. $v(s) = 630$. $s = \text{Arizona}$. In 2004 the state with 630,000 oversea visitors was Arizona.

b. $v(\text{Hawaii}) = 2215$. In 2004 Hawaii had 2,215,000 oversea visitors.

42 a. 164 pounds. In the third week since the diet started the person's weight was 164 pounds.

b. $t = 5$. In the 5th week since the diet started the person's weight was 160 pounds.

c. 165 pounds. This prediction will be fairly accurate since the weights do not vary greatly.

d. It does not seem reasonable for the person's weight to be 100 pounds.

43 a. \$400,000. The value of the Arizona home was \$400,000 in Aug 2005.

b. $m = \text{January 2006}$. In January 2006 the approximate value of the home was \$440,000.

c. $m = \text{July 2006}$. Factors that could effect the value of the home would be an economic downturn or more home coming on the market competing for buyer's business.

44. $C(2.76, 310)$

$$C(2.76, 310) = \frac{(2.76)(310)}{25} \approx \$34.22$$

45. $g(2, 3, 1)$

1.3

1 a. Omit

b.

$\frac{30-21}{40-35} = \frac{9}{5} = 1.8$
$\frac{47-30}{45-40} = \frac{17}{5} = 3.4$
$\frac{75-47}{50-45} = \frac{28}{5} = 5.6$

$\frac{124-75}{55-50} = \frac{51}{5} = 10.2$
$\frac{198-124}{60-55} = \frac{74}{5} = 14.8$
$\frac{348-198}{65-60} = \frac{150}{5} = 30$
$\frac{628-348}{70-65} = \frac{280}{5} = 56$

- c. (sample answer for each 5 –year interval): The monthly premium for \$1,000,000 of coverage increases on average \$1.80 for each year of increase in the male’s age from 35 to 40 years old.

2 a. Omit

b.

$\frac{25-21}{40-35} = \frac{4}{5} = \0.80
$\frac{41-25}{45-40} = \frac{16}{5} = \3.20
$\frac{57-41}{50-45} = \frac{16}{5} = \3.20
$\frac{88-57}{55-50} = \frac{31}{5} = \6.20
$\frac{130-88}{60-55} = \frac{42}{5} = \8.40
$\frac{209-130}{65-60} = \frac{79}{5} = \15.80
$\frac{361-209}{70-65} = \frac{152}{5} = \30.40

- c. (sample answer for each 5 –year interval): The monthly premium for \$1,000,000 of coverage increases on average \$0.80 for each year of increase in the female’s age from 35 to 40 years old.

3 a. Omit

b.

$\frac{37-44}{1} = -7\%$
$\frac{34-37}{1} = -3\%$

$\frac{32.5 - 34}{1} = 1.5\%$
$\frac{31.5 - 32.5}{1} = -1\%$
$\frac{30.5 - 31.5}{1} = -1\%$
$\frac{30 - 30.5}{1} = -0.5\%$

c. (sample answer for each 5 –year interval): The % of 16-year-olds with driver’s license decreased on average of 7% per year from 1998 to 1999.

4. a. Omit

b.

$\frac{16.0 - 7.5}{6 - 0} = \frac{8.5}{6} = 1.42$
$\frac{21.0 - 16.0}{12 - 6} = \frac{5}{6} = 0.83$
$\frac{24.0 - 21.0}{18 - 12} = \frac{3}{6} = 0.50$
$\frac{26.5 - 24.0}{24 - 18} = \frac{2.5}{6} = 0.417$
$\frac{28.5 - 26.5}{30 - 24} = \frac{2}{6} = 0.33$
$\frac{30.5 - 28.5}{36 - 30} = \frac{2}{6} = 0.33$

c. (sample answer for each 5 –year interval): The weight of girls in pounds increases on average 1.42 for each year of increase in the female’s age from birth to 6 months.

7. The average rate of change in the number of divorces between 1980 and 1985 is $\frac{21.7 - 22.7}{5} = -0.2$ divorced per 1000 married women per year. Assuming the change in divorces was constant from 1980 to 1985 we can estimate D(1982) by finding $22.7 - 0.2(2) = 22.3$. This means the estimated number of divorces per 1000 married women in 1982 is 22.3.

8. The average rate of change in China’s demand for oil (in millions of barrels per day) between 2004 and 2005 is $\frac{6.3 - 6.1}{1} = 0.2$ millions of barrels per day per year. Assuming the change in oil demand remains constant from 2005 to 2006,

we can estimate $D(2006)$ by finding $6.3 + 0.2(1) = 6.5$. This means the estimated number of China's oil demand to be 6.5 million barrels per day in 2006.

9. The average rate of change in Japan's bankruptcy filings (in thousands) between 2000 and 2002 is $\frac{225.0 - 149.0}{2} = \frac{76}{2} = 38$ thousand bankruptcies per year.

Assuming the change in bankruptcies remains constant from 2000 to 2002, we can estimate $N(2001)$ by finding $149.0 + 38(1) = 187$. This means the estimated number of Japan's bankruptcies to be 187,000 in 2001.

10. From February to March the number of private trips given to US lawmakers in 2006 dropped by 32. It would not be reasonable to assume the same decrease from March to April because there would be a negative number of private trips. Therefore a reasonable estimate would be any number less than or equal to 29.

11. The average rate of change in Amazon's net income (in billions of dollars) between 2002 and 2003 is $\frac{5.3 - 3.9}{1} = 1.4$ billion dollars per year. Assuming the change in Amazon's net income remained constant from 2001 to 2003, we can estimate $R(2001)$ by finding $3.9 - 1.4 = 2.5$. This means the estimated amount of Amazon's net income in 2001 to be 2.5 billion dollars.

12. The average rate of change in Amazon's net income (in billions of dollars) between 2006 and 2007 is $\frac{14.8 - 10.7}{1} = 4.1$ billion dollars per year. Assuming the change in Amazon's net income remained constant from 2007 to 2008, we can estimate $R(2008)$ by finding $14.8 + 4.1 = 18.9$. This means the estimated amount of Amazon's net income in 2008 to be 18.9 billion dollars.

19. a. Arizona. From 1940 to 1950 the increase in homeownerships was 8.5%.

b. Arizona. From 1980 to 1990 the decrease in homeownership was -2.4%.

- 20a. From May to July and From August to October the rate of change is increasing. From May to June the rate of change was $\frac{0.01}{1}$ and from June to July it was $\frac{0.07}{1}$. From August to September the rate of change was $\frac{-0.03}{1}$ and from September to October it was $\frac{0.10}{1}$.

b. There are four intervals of time when $E(m)$ is decreasing. They are from March to May ($\frac{0.20}{1}$ and $\frac{-0.01}{1}$), May to July ($\frac{0.15}{1}$ and $\frac{-0.16}{1}$), July to

October ($\frac{0.14}{1}$, $\frac{-0.01}{1}$, and $\frac{-0.17}{1}$), and October to December ($\frac{-0.01}{1}$ and $\frac{-0.33}{1}$).

c. There are three intervals of time when $N(m)$ is decreasing. They are from February to April ($\frac{0.06}{1}$ and $\frac{-0.03}{1}$), June to August ($\frac{0.07}{1}$ and $\frac{-0.09}{1}$), and September to November ($\frac{0.10}{1}$ and $\frac{-0.11}{1}$).

$$P(5, 8) = 2(5) + 2(8)$$

$$\begin{aligned} 21. \text{ a. } &= 10 + 16 \\ &= 26 \end{aligned}$$

b. Perimeter when the width is 5 and the length is 8.

$$\begin{aligned} 22. \text{ a. } &P(103, 808) = 2(103) + 2(808) \\ &= 1822 \end{aligned}$$

b. Perimeter when the width is 103 and the length is 808.

$$\begin{aligned} 27. \text{ a. } &B(500, 0.05, 12, 2) = 500(1 + \frac{0.05}{12})^{12 \cdot 2} \\ &= \$552.47 \end{aligned}$$

b. The balance in the investment account when \$500 in the amount invested at an interest rate of 5% with 12 compoundings per year for 2 years.

$$29. S(60, 0.75, 1) = \sqrt{30(60)(0.75)(1)} = 36.74$$

$$\begin{aligned} 31. & \\ &30,000 = 0.06s + 12000 \\ &18,000 = 0.06s \\ &300,000 = s \end{aligned}$$

33.

$$98.33 = \frac{9}{5}k - 459.67$$

$$558 = \frac{9}{5}k$$

$$558 \cdot \frac{5}{9} = k$$

$$310 = k$$

43a. $T(m) = 317.54m + 2000$

b.

$$\begin{aligned} T(60) &= 317.54(60) + 2000 \\ &= \$21,052.40 \end{aligned}$$

c. $21,052.4 - 18,366 = \$2686.40$

44a. $T(m) = 172.55m + 3000$

b.

$$\begin{aligned} T(72) &= 172.55(72) + 3000 \\ &= \$15,423.60 \end{aligned}$$

c. $15,423.60 - 13,210 = \$2,213.60$

45a.

$$\begin{aligned} M(2000, 0.005, 24) &= 2000 \left(\frac{0.005(1 + 0.005)^{24}}{(1 + 0.005)^{24} - 1} \right) \\ &= 88.64 \end{aligned}$$

b. The monthly payments on a 24-month loan of \$2000 at 0.5% is \$88.64.

47.

$$\begin{aligned} FV(10, 0.00425, 60) &= 10 \left(\frac{(1 + 0.00425)^{60} - 1}{0.00425} \right) \\ &= \$681.80 \end{aligned}$$

The future value of an investment with a constant monthly payment of \$10 after 60 months and 9 monthly interest rate of 0.00425 is \$681.80.

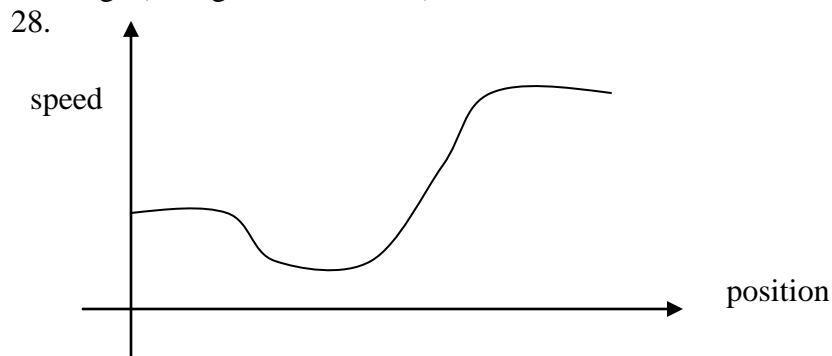
1.4

6. $g(-1) \approx -0.8$

7. x has not solution

8. $x \approx -3.1, 0, 3.1$
9. $g(0) = 0$
10. $g(1.5) = 1$
11. $f(g) = e$
12. $f(x) = a, x = 0$
13. $f(x) = d, x = m$ and $x = \text{some value between } g \text{ and } h$
14. $f(n) = e$
15. $f(j) = b$
16. (answers vary) The practical domain is $0 \leq y \leq 4$. The practical range is $0 \leq c \leq 4500$.
17.
 - a. (answers vary) The practical domain is $0 \leq t \leq 100$. The practical range is $52 \leq m \leq 64$.
 - b. As the years increase after 1900, the cigarette consumption increases until 1960 and then decreases until 2000.
 - c. The cigarette consumption in the year 1900.

18. graph A
19. graph E
20. graph C
21. graph B
22. graph D
23. The vertical intercept represents the initial amount of air in the balloon. The horizontal intercepts represent the two times when there was no air in the balloon.
24. The vertical intercept represents the initial distance the person was from the classroom. The horizontal intercept represents the time when the person reaches class.
25. The vertical intercept represents the initial number of times the lawn was mowed (which would be 0). The horizontal intercept represents the time when there were no cumulative lawn mowings.
27. (answers vary) The practical domain (in minutes) is $0 \leq m \leq 60$. The practical range (in degrees Fahrenheit) is $31 \leq T \leq 76$.



- 29 a. Hiker A is ahead after 1 hour because he has been hiking faster the whole time.
- b. Hiker A is hiking faster than Hiker B because his speed (the vertical coordinates) is greater at that time.
- c. Hiker A is pulling away from Hiker B because his speed (vertical coordinates) are all greater during the interval of time from 45 minutes to 1 hour.
- 30 a. No, the data does not represent a function because multiple golfers may set the tee at the same height, yet average different drive distances.
- b. The data could be as spread out as it is because each golfer has their own preference as to where to set the tee height to achieve various drive distances.
- c. Making predictions would not be accurate because the data is collected from many different golfers. If the data were all collected from one individual golfer, then changing the tee height would give relatively accurate predictions.
- 31 a. When the tram is 100 horizontal feet from the its original position it would be approximately 400 vertical feet.
- b. When the tram is 500 vertical feet off the ground it is either 150 or 450 vertical feet off the ground.
- c. No, the arch is only 600 feet wide.
- d. 200 feet above ground the width of the arch is approximately 500 horizontal feet. If the wingspan of the plane is 46 feet then there should be $\frac{(500 - 46) \text{ feet}}{2}$ on each side. So, 227 feet on either side of the plane to the inside edge of the arch.

1.6

- 1a. independent variable: time water has been running; dependent variable: height of bathtub water
- b. independent variable: height of bathtub water; dependent variable: time water has been running
- 4a. independent variable: the days since June 1; dependent variable: total amount of rain that falls on a person's lawn
- b. independent variable: total amount of rain that falls on a person's lawn;

dependent variable: the days since June 1

6a. independent variable: the week; dependent variable: the number of hours that students in class work

b. independent variable: the number of hours that students in class work; dependent variable: the week

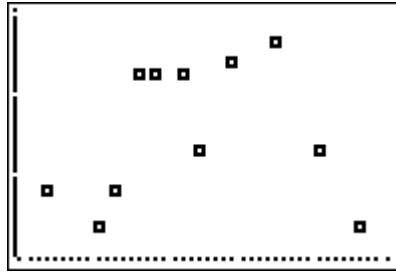
10a. independent variable: quarters of a basketball game; dependent variable: the number of points scored

b. independent variable: the number of points scored; dependent variable: quarters of a basketball game

11. $S(t)$ is the function relationship that links the dependent variable, speed, to the independent variable, time.

12. $S(22) = 54$. 22 seconds into the chase scene the car is traveling 54 mph.

13.



14. the inverse relationship would represent the time elapsed in the chase at any speed during the chase.

16 a. $f^{-1}(c) = t$ is the inverse function relationship of $c(t)$ where $c = \%$ of people cremated is the independent variable and $t =$ the number of years since 1980 is the dependent variable.

b.

$$40 = 0.8071t + 9.5811$$

$$30.4189 = 0.8071t$$

$$37.69 = t$$

Sometime between the year 2017 and 2018 the percent of people that are cremated will be 40%.

c.

$$f^{-1}(c) = 1.239c - 11.871$$

$$f^{-1}(40) = 1.239(40) - 11.871$$

$$f^{-1}(40) = 37.69$$

When the percentage of people choosing cremation is 40% the year will be between 2017 and 2018.

d. The results to b. and c. represent the same data point and the relationship between the year and % cremated. In part b. 40% is the output so we had to solve for the independent variable t whereas in part c., the inverse uses the % as the input so we just had to evaluate.

19. $v(t) = -0.0107t + 0.836$ where t = the number of years after 1990 and v = the value of a dollar. $f^{-1}(0.44) = 37$. When the value of the dollar is \$0.44 it will be 37 years past 1990 which is 2027.

21. The amount of revenue generated by cell phone sales \$8,077,000,000 when the revenue of pager sales was \$811,000,000.

Chapter 1 Review

2a. the total attendance is generally increasing but not at a constant rate.

b. (answers vary). If we assume the change in attendance from 2003 to 2004 continues we estimate that in 2006 there was $21709 + 2(70) = 21,849$ thousand or 21,849,000 fans.

5a. The coverage number of persons per vehicle decreased for 15 years and then leveled off.

b. If there are 1.6 persons per vehicle we mean that if we hypothetically take all of the people in all the vehicles and divide them up equally there would be 1.6 people in each.

c. (answers vary). A possible reason for the decline could be that cars got smaller due to fuel costs increases.

6. If we let c = the number of calories and f = amount of food consumed
independent variable: amount of food consumed; dependent variable: calories

9a. r = southwest. In 2004 the average cost of tuition was \$4569 in the American Southwest.

b. \$6839. In 2004 the average cost of tuition was \$6839 in the New England.

12a.

$\frac{25.6-19.4}{6-0} = 1.03$
$\frac{29.0-25.6}{12-6} = 0.57$
$\frac{31.6-29.0}{18-12} = 0.43$
$\frac{33.8-31.6}{24-18} = 0.37$
$\frac{35.8-33.8}{30-24} = 0.33$
$\frac{37.4-35.8}{36-30} = 0.27$

b. As baby girls' age increases, their heights increase at a slower rate.

15. (answers vary) If we assume the same decrease in receipts from weekend 6 to 7 we estimate $1.343 - 1.678 = -0.335$ which is unreasonable. Therefore, we estimate 0.6.

20.

$$35 = \frac{5}{9}(F - 32)$$

$$35 \cdot \frac{9}{5} = F - 32$$

$$19.44 = F - 32$$

$$51.4^\circ = F$$

24a. graph D

b. graph F

c. graph E

25a.

graph D; vertical intercept: the initial (time = 0) temperature of the car. horizontal intercept: there will not be one. This would mean the time the temperature in the car is 0° .

graph E; vertical intercept: the person's initial (time = 0) heart rate. horizontal intercept: there will not be one. This would mean the time when the heart rate is 0 beats per minute.

graph F; vertical intercept: the initial (time = 0) value of the car. horizontal intercept: there will not be one. This would mean the time when the car is worth \$0.

b.

graph D; (answers vary) Let m = the time in car in minutes and T = temperature of the car in degrees Fahrenheit. practical domain: $0 \leq m \leq 10$, practical range: $78 \leq T \leq 92$.

graph E; (answers vary) Let m = months working out and H = heart rate in beats per minute. practical domain: $0 \leq m \leq 12$, practical range: $100 \leq H \leq 130$.

graph F; (answers vary) Let t = time car is owned in years since 1964 and V = value of the car in \$. practical domain: $0 \leq t \leq 45$, practical range: $5000 \leq V \leq 40,000$.

32

a. The cable tv subscribers (in millions) as a function of daily newspaper circulation (in millions).

b.

$$60 = -0.3824C + 81.574$$

$$-21.574 = -0.3824C$$

$$56.42 = C$$

When the daily newspaper circulation is 60 million the number of cable tv subscribers is 56,420,000.

c.

$$\begin{aligned} f^{-1}(60) &= -2.62(60) + 213.32 \\ &= 56.12 \end{aligned}$$

When the daily newspaper circulation is 60 million the number of cable tv subscribers is 56,120,000.

d. Parts (b) and (c) should be equivalent. Note that they are not due to rounding.